

# **Modifications to the Dual Beam Laser Head Holder**

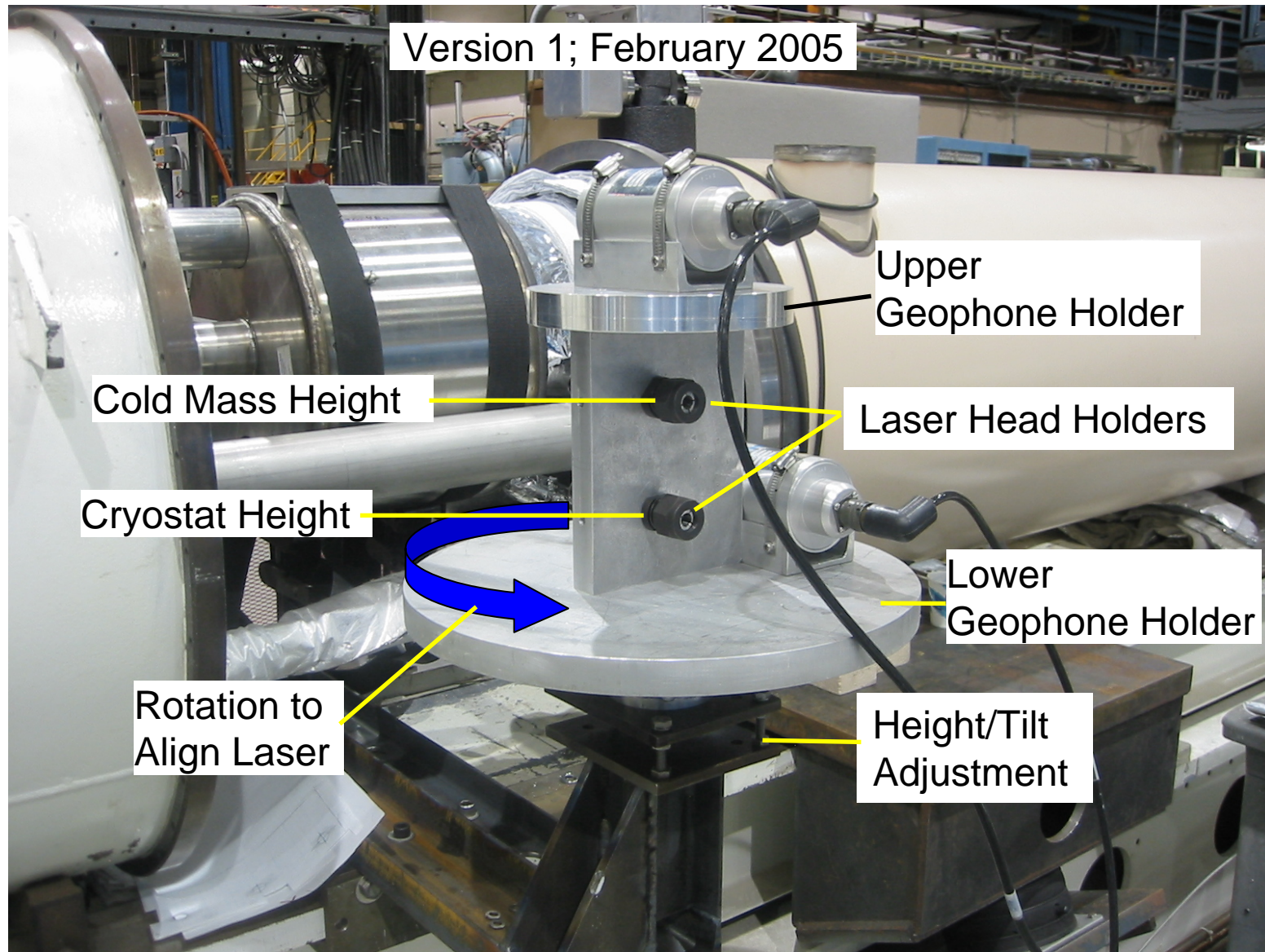
Superconducting Magnet Division, BNL

BNL-SLAC TeleConference: May 9, 2005

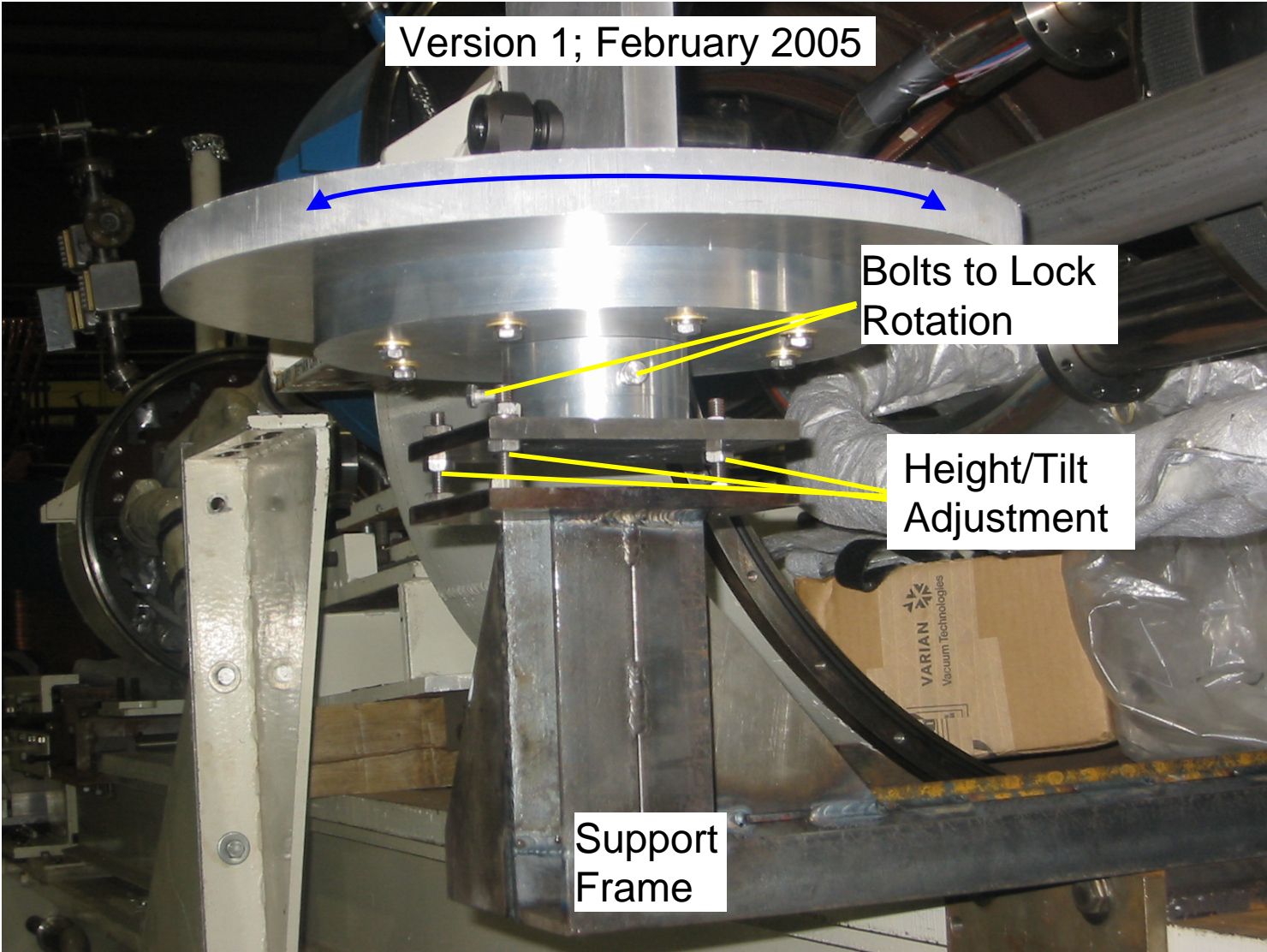
# Recent Activities

- Preparations are underway to carry out vibration measurements in a RHIC quadrupole using a dual beam laser Doppler vibrometer.
- A fixture is designed and built to mount the fiber-optic laser heads on the cold test stand for measuring horizontal motion.
- Vibration characteristics of the fixture has been studied using geophones.
- Some iterations have been made to reduce the fixture vibrations.
- The laser vibrometer has been ordered, and is expected to be delivered in about 7-8 weeks (~end of June).

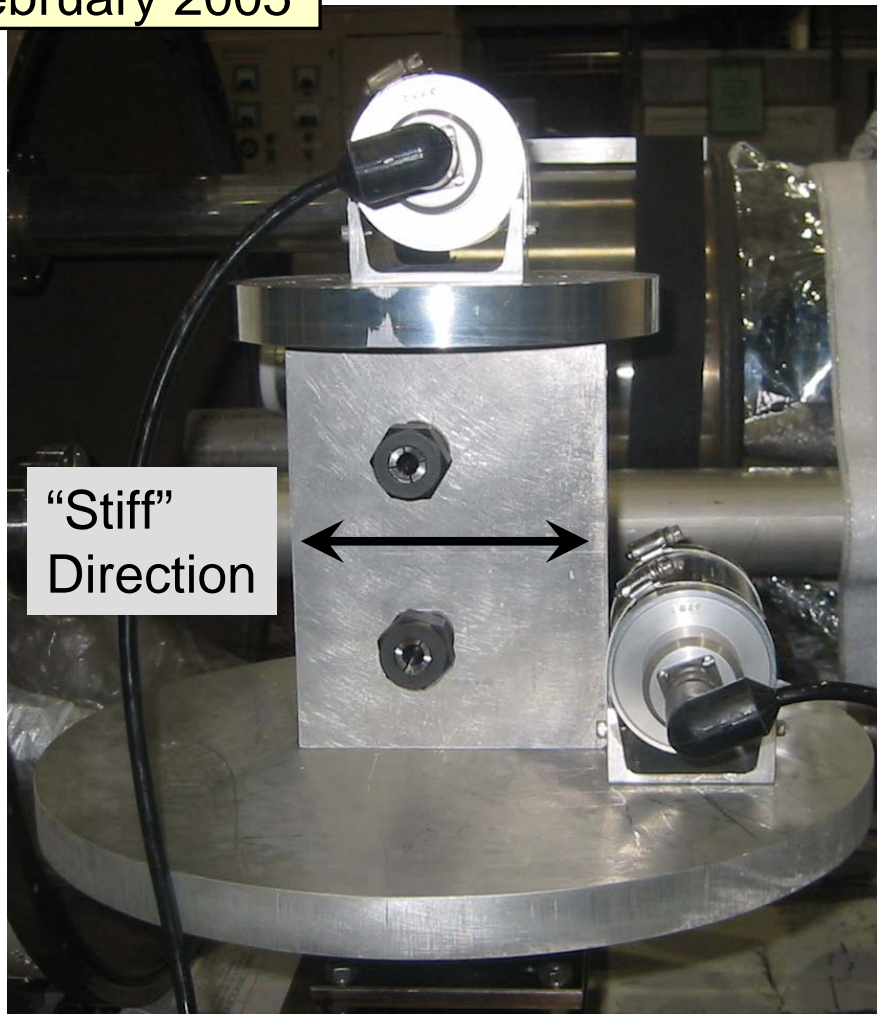
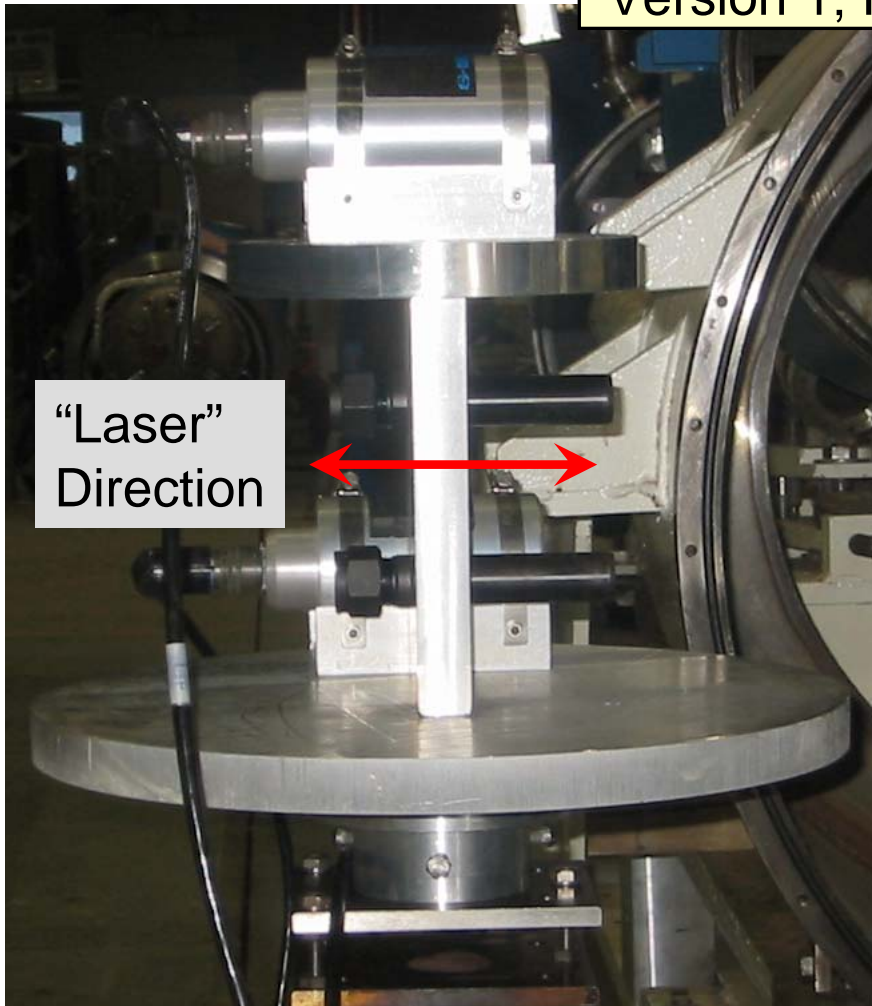
# Laser Holder(Horizontal) on the Test Stand



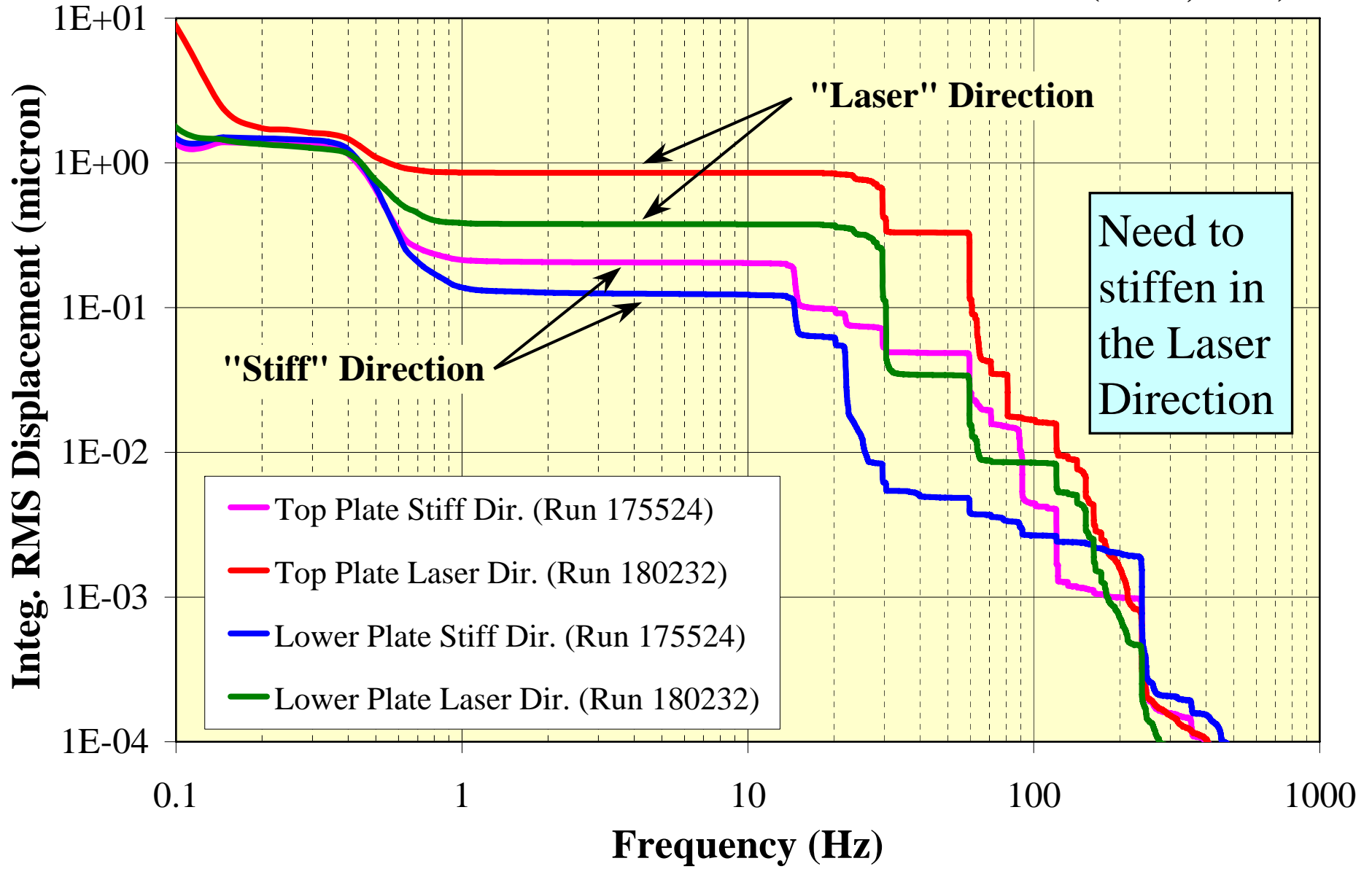
# Laser Holder Adjustment Details



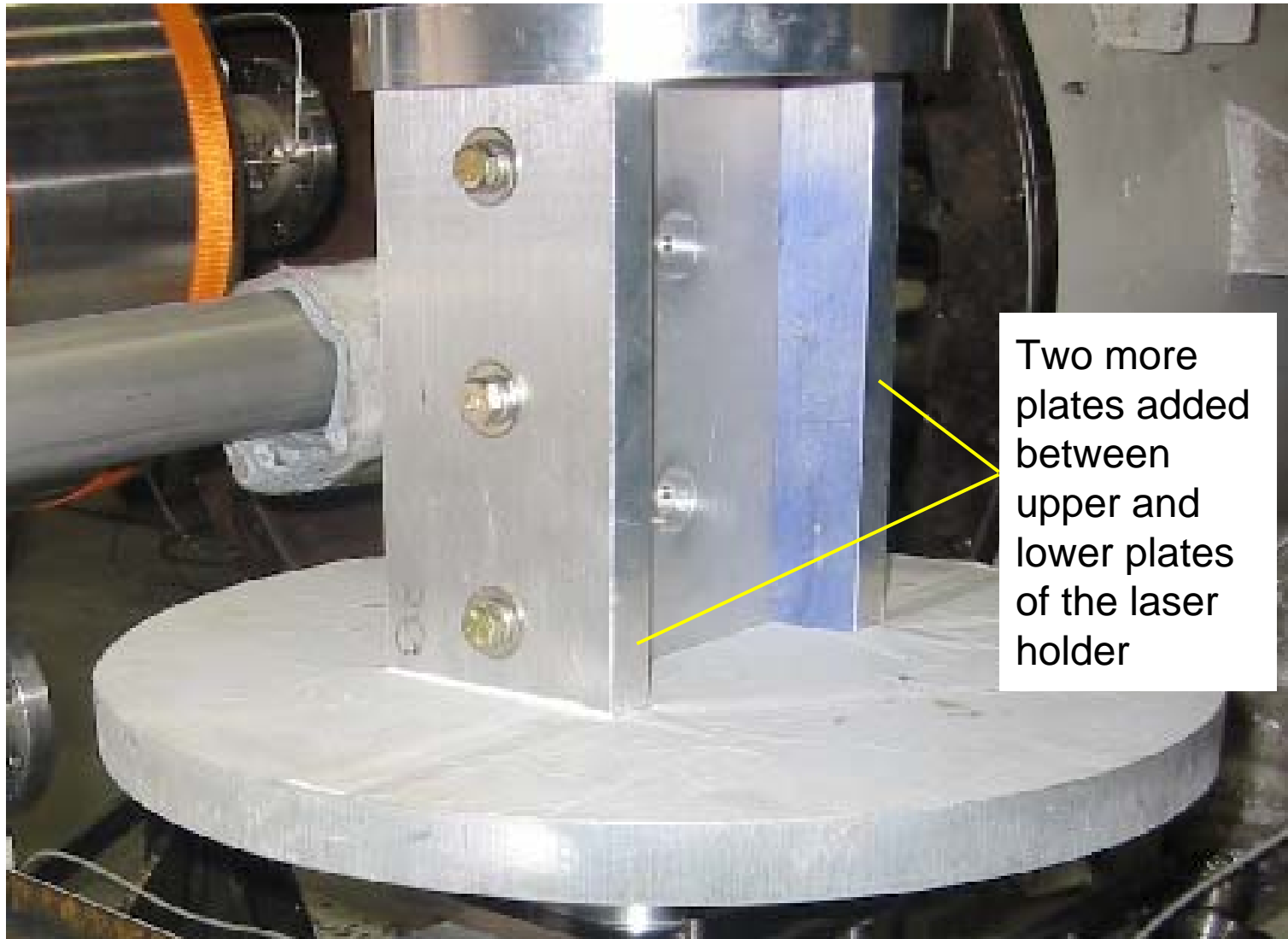
Version 1; February 2005



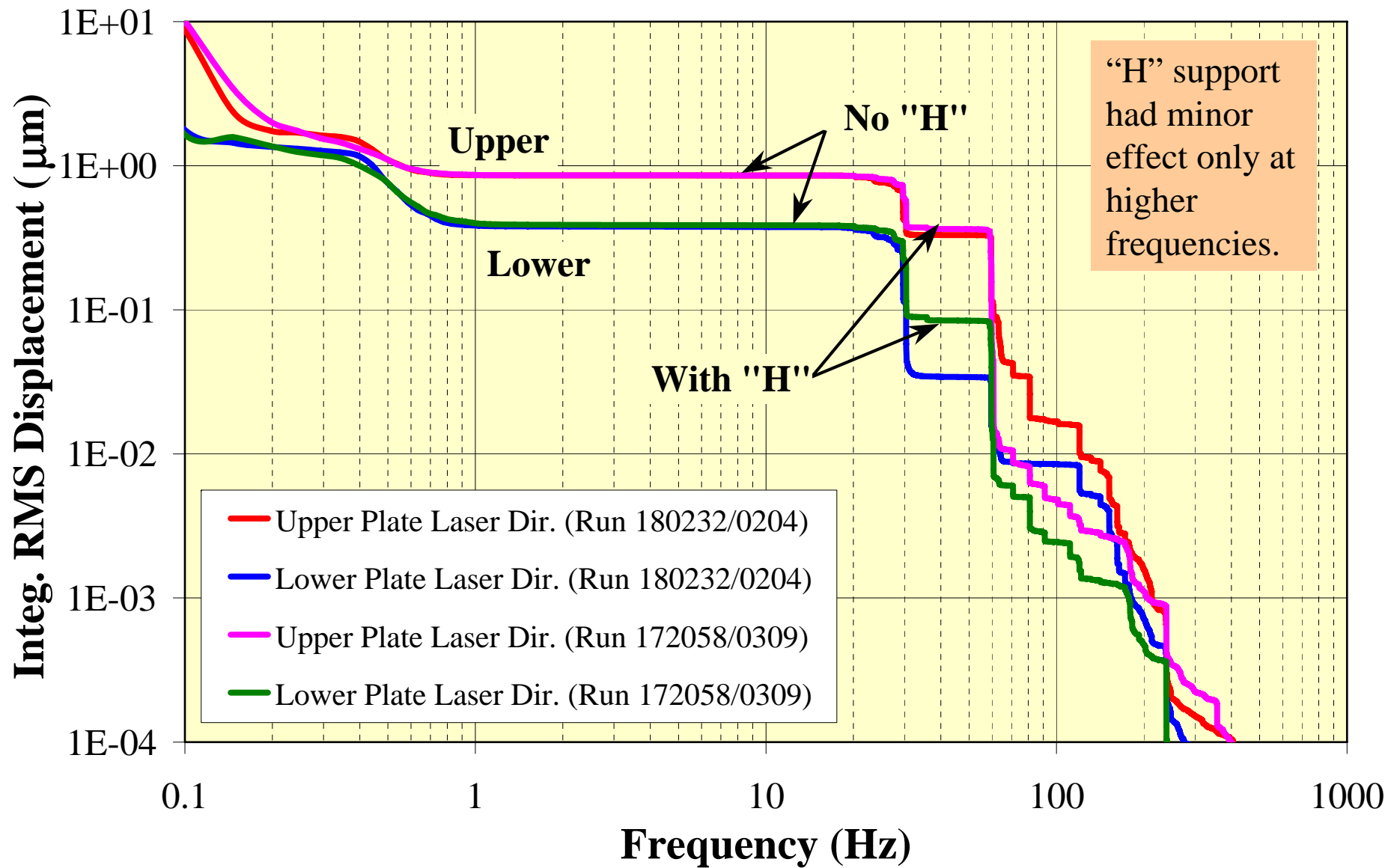
# Horiz. Motion of Laser Holder in Different Directions (Feb.4, 2005)



# “H-shaped” Support Added



# Motion of Laser Holder in Laser Direction With & Without "H"

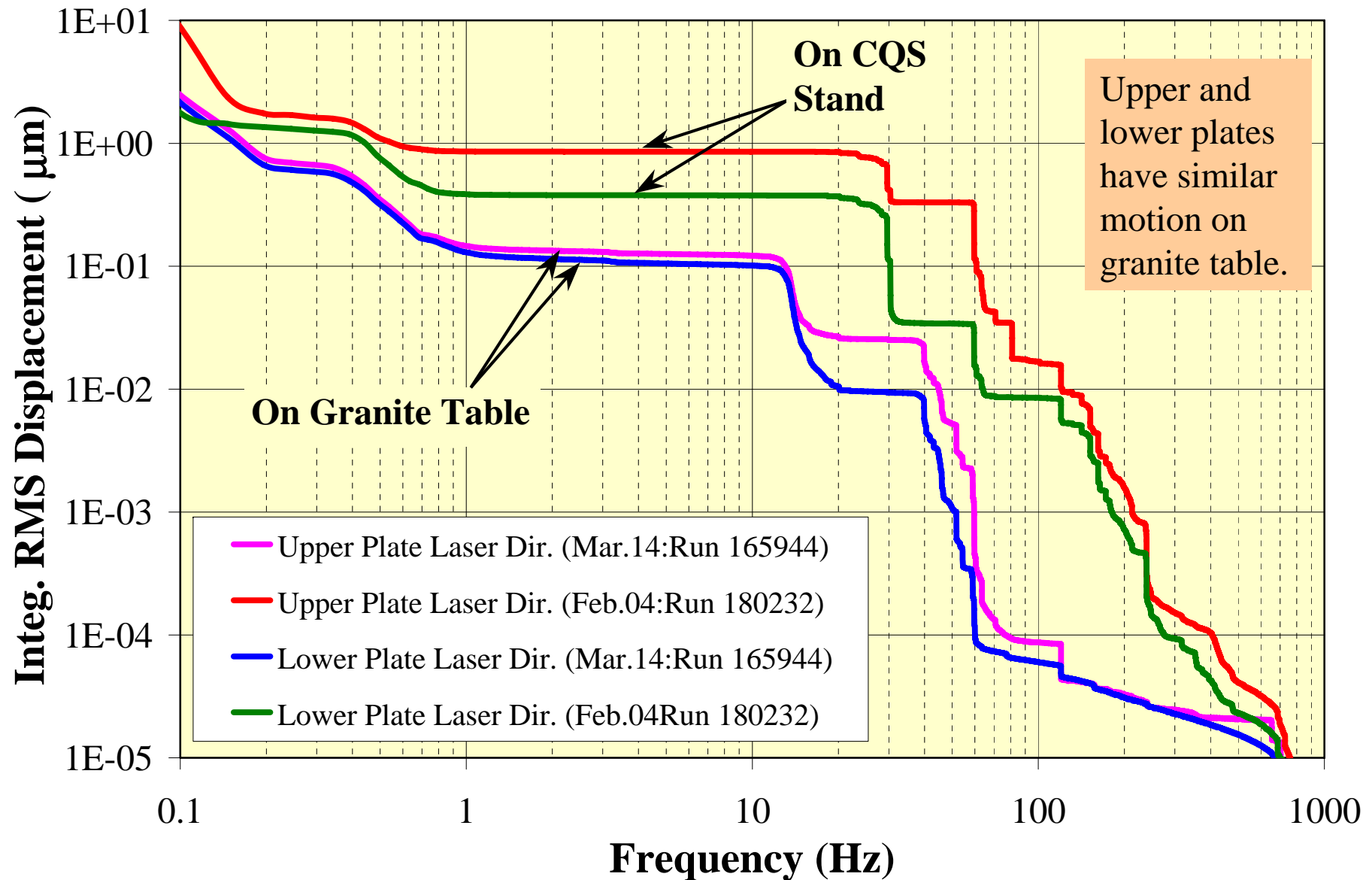




# Internal motion?

- Since the H-shaped support did not help to reduce the motion along the “laser” direction, we checked to see if the motion is internal motion of the laser holder.
- We put the laser holder itself on a granite table in tent area (less noisy than CQS test stand) to check the relative motion of the top and bottom plates.

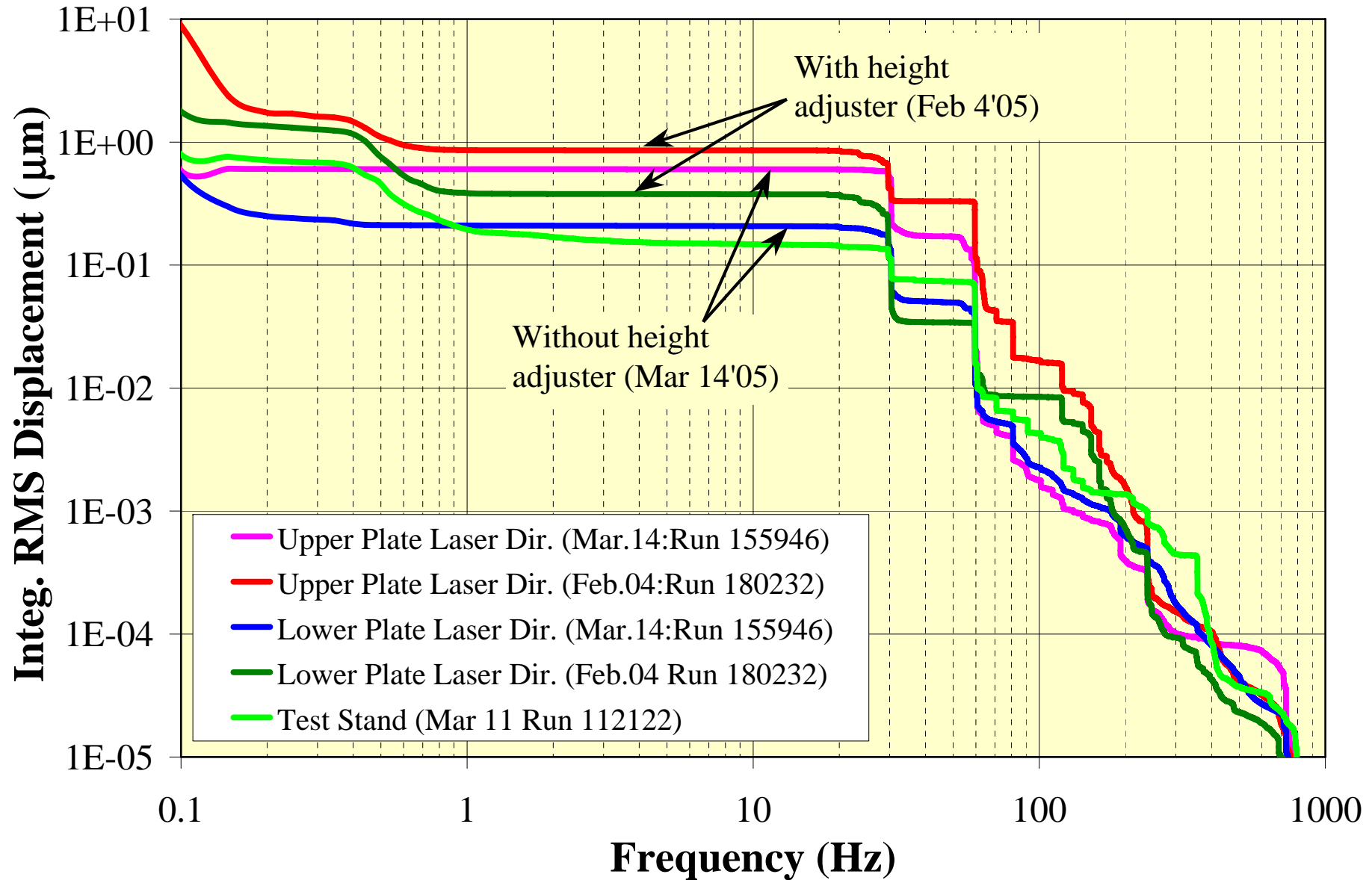
# Check Internal Motion of Laser Head Holder



# Internal motion? Very small

- The results show the internal motion is very small.
- The motions of the upper and lower plates along the “laser” direction are quite similar, within 20%.
- Large difference between the two plates on CQS stand implies cantilever motion of the holder as a whole.
- We decided to modify the support bar under the laser holder.
- We also made a test by putting the laser holder directly on the support bar (no height/tilt adjustment) to see if the height adjuster was causing large motion.

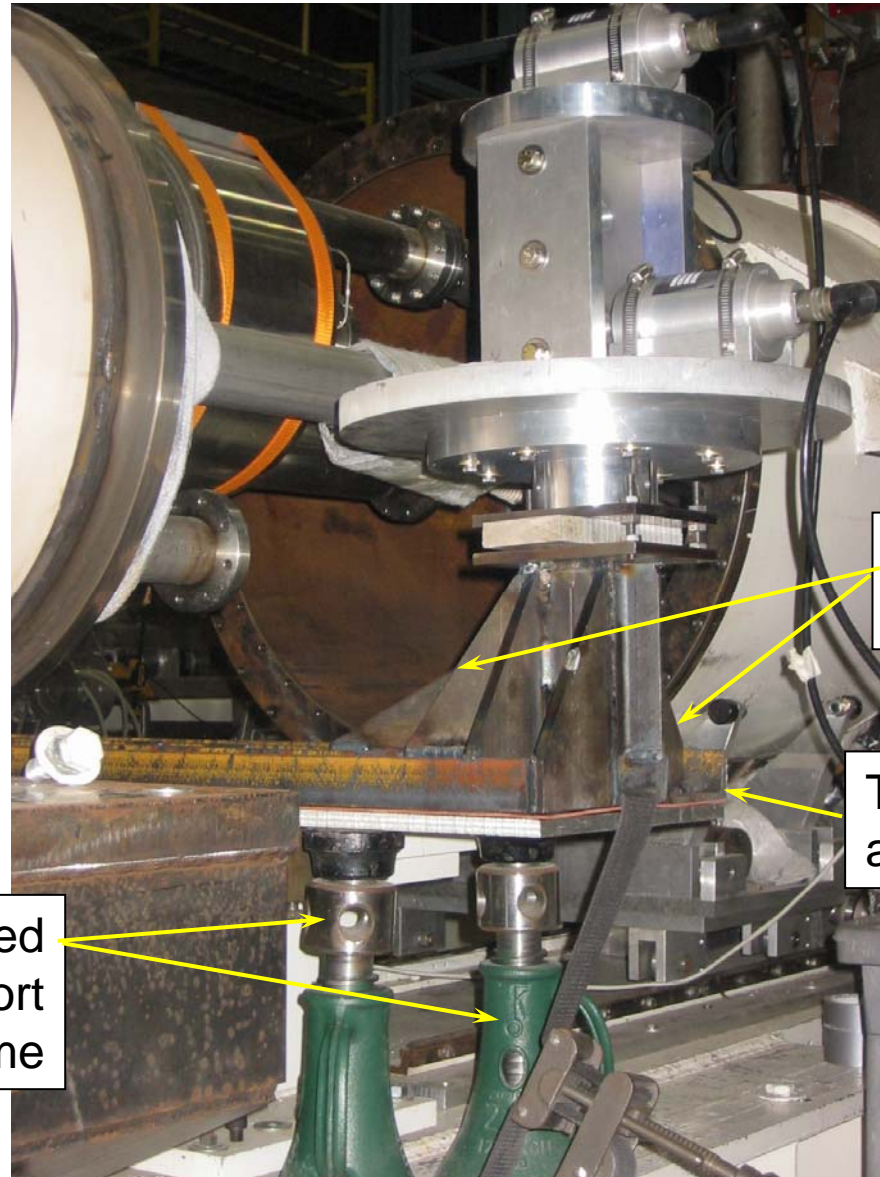
# Effect of the Height/Tilt Adjuster



## Further modification...

- Without height adjuster, the motions of upper and lower plates of laser holder were reduced by about a factor of 2, but still about 50% higher compared to the test stand.
- This implies motion from the support frame.
- Further modifications needed on the support frame.
- An improved version of support frame was built with several stiffening modifications.

# Improvements to the Support Frame

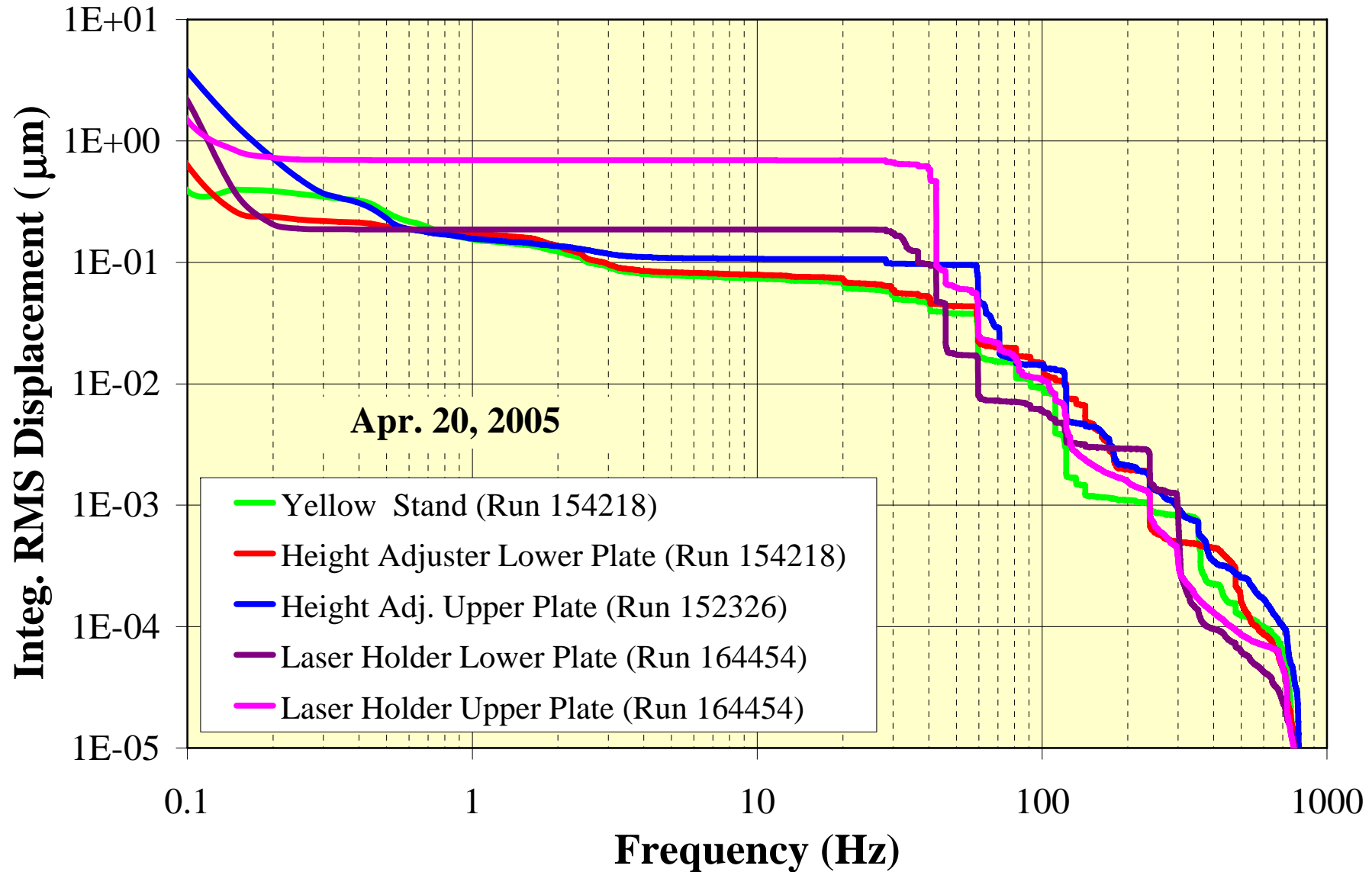


Two Jacks placed  
under Support  
Frame

More Triangular  
Supports added

Third C-channel  
added

# Measurements with Improved Support Frame

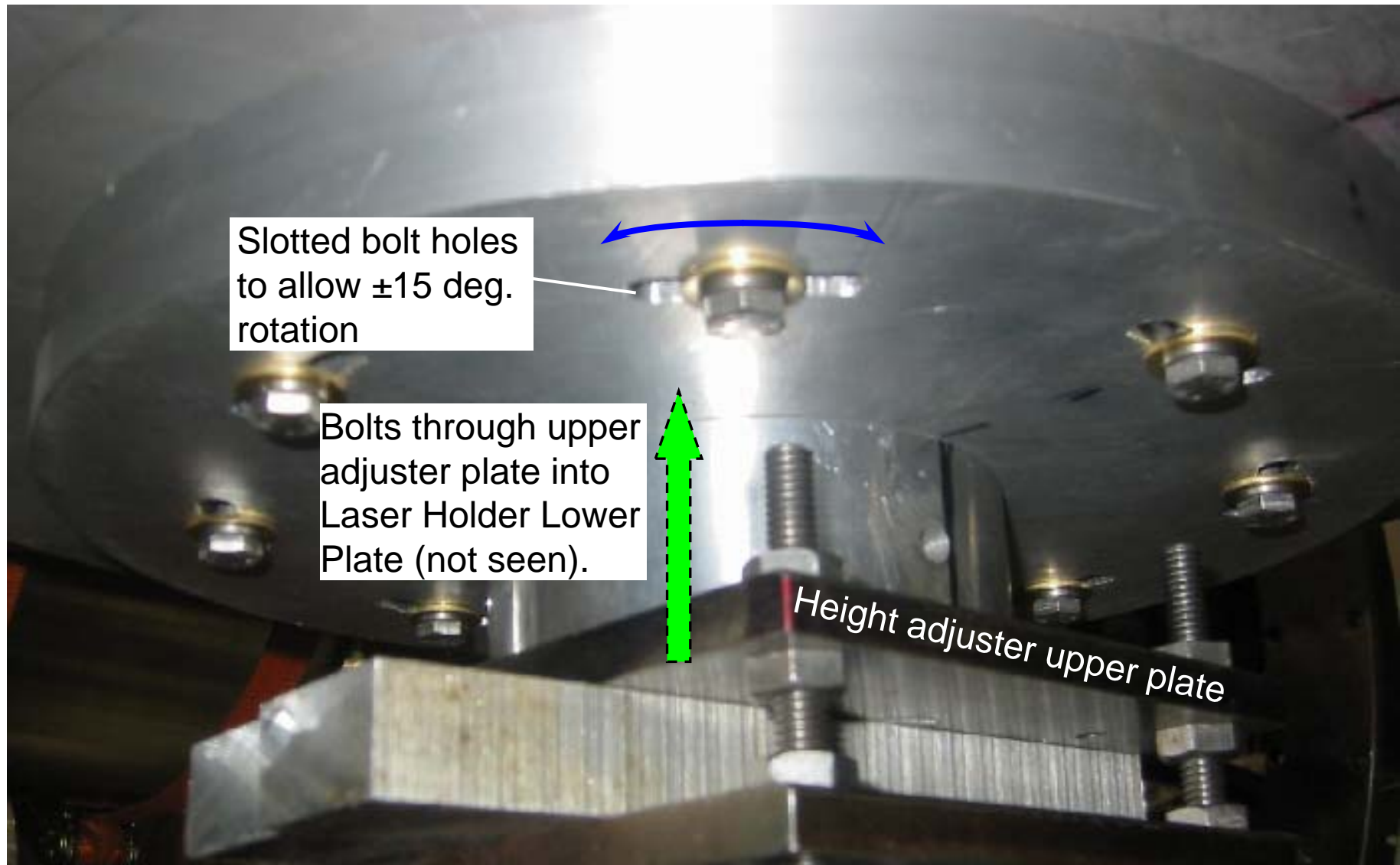


# Results with Improved Support

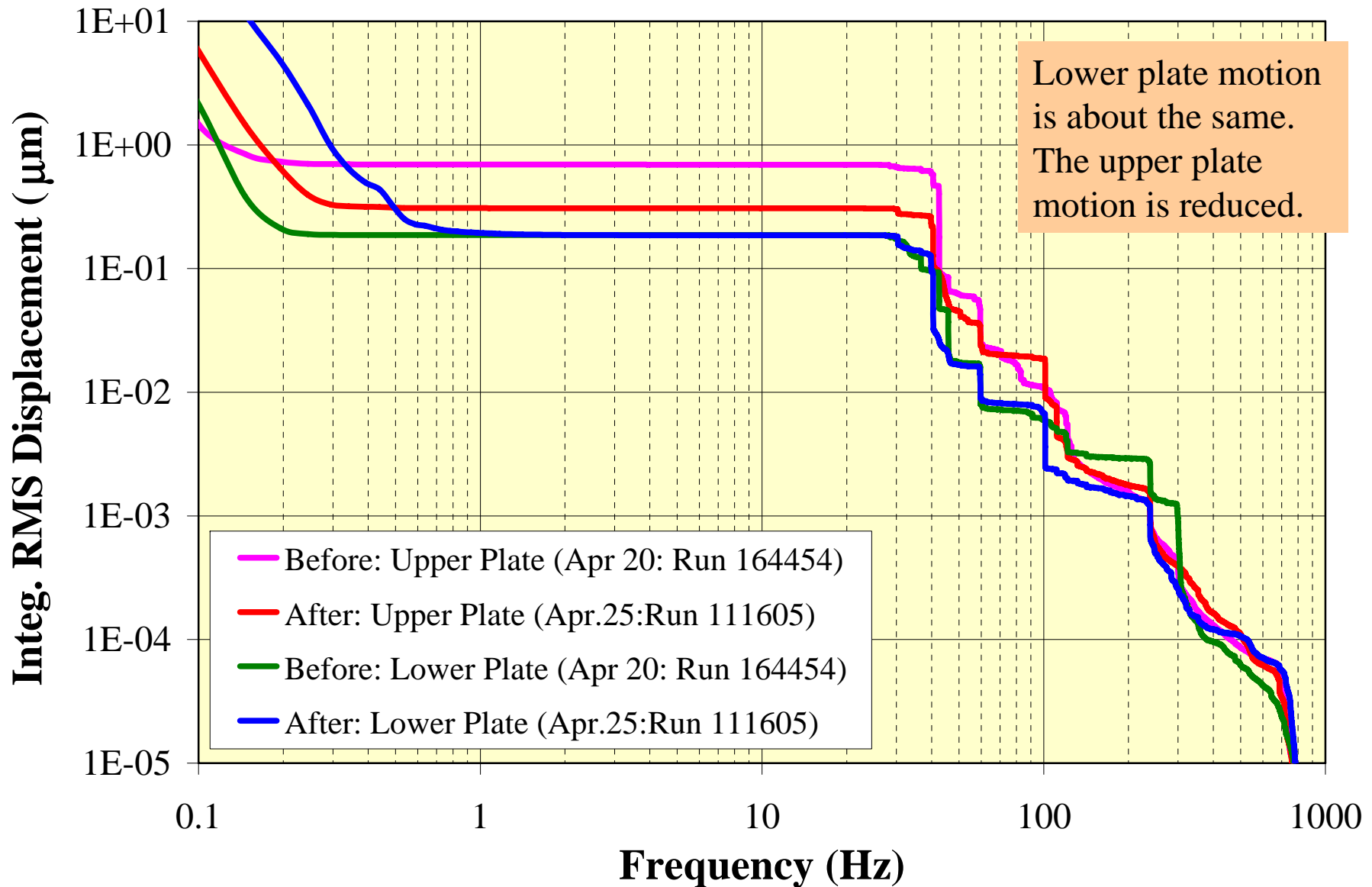
- Motion along “laser” direction is almost the same for the yellow stand and the lower plate of height adjuster. Even for the top plate of the adjuster, it is only ~30% above the yellow stand.
- However, the laser holder mounted on the height adjuster still has significantly larger motion.
- We realized the junction between laser holder and the height adjuster, which is also used to rotate the holder and align the laser, has to be modified.
- Instead of a freely rotatable joint, we bolted the laser holder to the height adjuster upper plate.



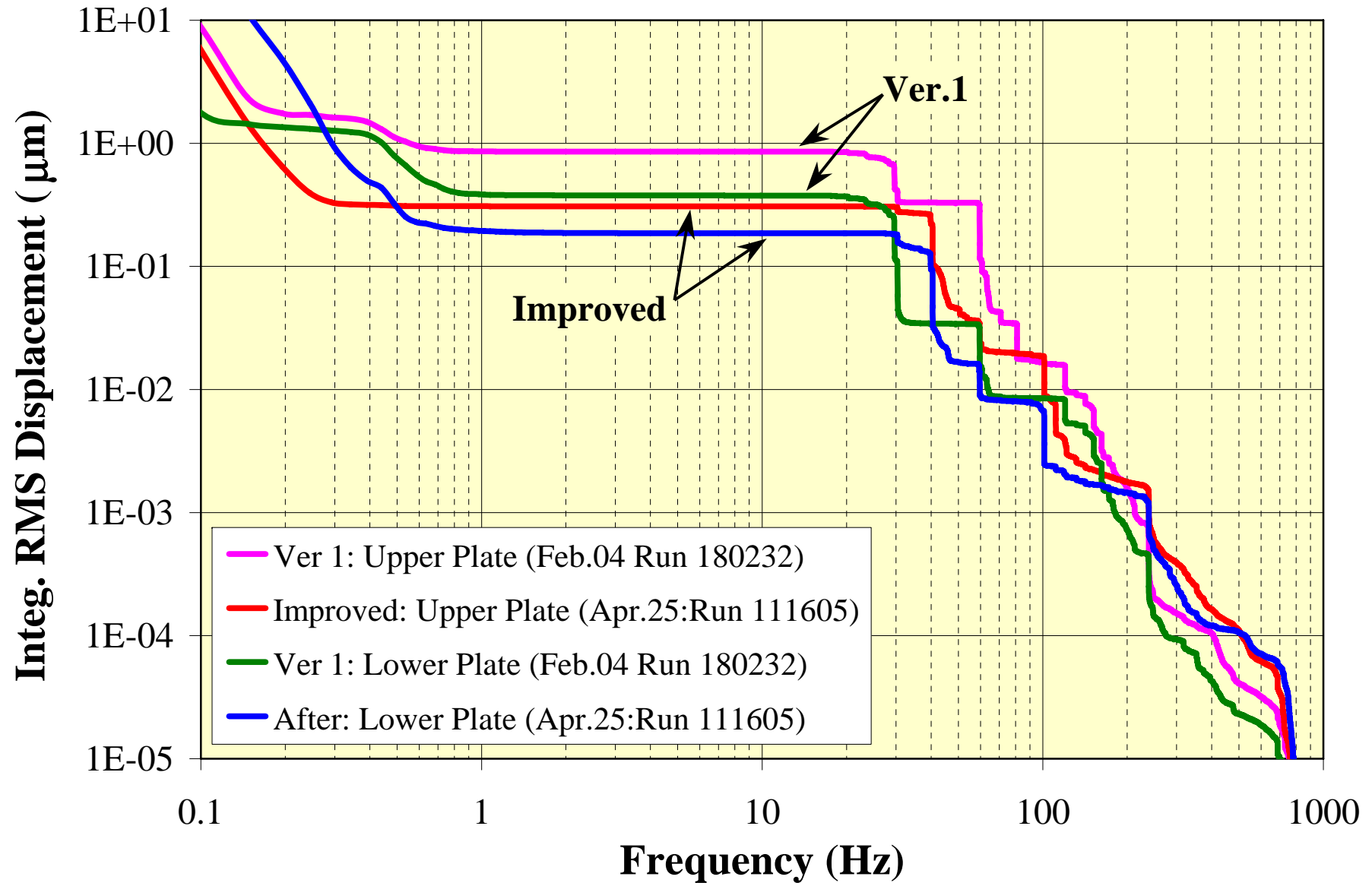
# Rotation to Align Laser



# Improvements Made with Modified Mount



# Comparison Between Ver.1 and Improved Fixture



# Summary of Laser Holder Measurements

- Measurement results show that the horizontal motion in the “Laser” direction is reduced about factor 2 with the several improvements made.
- Motion of the upper plate is still more than the lower plate.
- We believe the relative motion of the two laser sensor heads should be well below the relative motion of the two plates.
- It will still be desirable to further reduce the motion of the laser holder as a whole.